G. Dzierżanowski, *Stress energy minimization as a tool in the material layout design of shallow shells,*
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The present research deals with the compliance minimization problem of an elastic thin shallow shell subjected to simultaneous in-plane and bending loads. In this context, our goal is to lay out a given amount of material in the volume of a shell assuming that the distribution in the direction transversal to its middle surface *S* is homogeneous. The discussion hence reduces to the question of finding the optimal material arrangement on *S*. Similar problems were solved in the framework of two dimensional elasticity or Kirchhoff plate theory and the present research attempts to generalize these results. Following the pattern emerging from the above mentioned considerations, our research starts from the minimum compliance problem of a structure made of two elastic materials whose volumetric fractions are fixed. The existence of a solution to thus posed optimization task is guaranteed if the fine-scale microstructural composites are admitted in the analysis. Their constitutive tensors can be obtained by certain averaging ensuing from the theory of homogenization for periodic media. Additionally, by the Castigliano Theorem, the compliance minimization problem is equivalent to the one for structural stress energy. In turn, the lower estimation of the energy is achieved in two steps: (i) its modification by a certain energy-like functional, and (ii) utilizing the quasiconvexity property of thus obtained expression. As a result, formulae describing the effective stress energy of one-material shallow shell and the material distribution function are explicitly derived.